

Reserve

Report
of
Livestock Pest Control Conferences
held at
Oklahoma City, Okla., October 21-22
and
Cheyenne, Wyo., October 24-25, 1946

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The conferences held at Oklahoma City, Oklahoma, October 21-22 and at Cheyenne, Wyoming, October 24-25, 1946, on livestock pest control came about through letters addressed to the directors of agricultural extension and the directors of the agricultural experiment stations of the States concerned, by M. L. Wilson, Director of Extension Service and R. W. Trullinger, Chief of Office of Experiment Stations, USDA, respectively. Interest in the need for holding such conferences was practically unanimous on the part of the State Directors.

Representatives from all States west of the Mississippi River with the exception of California and Minnesota were in attendance. These representatives included entomologists, veterinarians, animal husbandmen in the fields of research and extension and a few administrators and county agents. Both research and extension workers represented the USDA.

The conferences were informal in character and M. P. Jones and C. D. Lowe were elected chairman and secretary, respectively. Topics were taken up in the following order: cattle grubs, lice, flies, and other livestock pests (screw-worms, ticks, etc.). Under each topic research results from Federal and State sources were presented, followed by reports of extension activities State by State. Free discussion of each topic was encouraged and engaged in so that a full and comprehensive cross-section of thinking would be obtained.

At the opening of each conference small committees were selected to take notes and to prepare reports on each of the major topics discussed. These reports including recommendations were presented to the whole group for discussion and approval at the close of each meeting.

These reports are approved follow and lists of those attending the two conferences and of pertinent literature are appended.

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Oklahoma City

Cattle Grub Committee Report

M. W. Muldrow, H. Schmidt, J. N. Roney, Chairman

The committee reports:--Rotenone is the only toxicant recommended for control of the cattle grub. The rotenone powder may be used as a dust or in water suspension. The rotenone bearing powder should be 325-mesh fineness and contain 5% rotenone.

The toxicant may be applied as a dust, a spray, by hand washing or dipping.

Dust

For a complete coverage of infested areas a minimum of 3 ounces of dust per animal should be used and thoroughly worked into the animal's hair. Power dusters have not proved effective as yet.

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The dusts should contain the following proportions of ingredients:

1 part by weight of rotenone bearing powder (ground root)

2 parts by weight of a diluent--namely, tripoli earth or pyrophyllite.

Sprays

Power spraying is very satisfactory for use on large herds. The fastest operation can be obtained with a nozzle pressure of 400-500 pounds per square inch. With this pressure and a 3 nozzle boom and No. 4 discs, an animal can be sprayed in 8 to 10 seconds. At lower pressures a much longer time for application is needed to obtain a thorough wetting of the skin. If dipping is used the animals should be held in the vat a minimum of 2 minutes.

Recommended formula for sprays:

7-1/2 pounds of 5% rotenone bearing powder (ground root)

100 gallons of water

Amount generally required is one gallon per grown animal.

When power sprayer is used no wetting agent is needed, but such is necessary for washes and dips.

Washes

Formula: 12 ounces of 5% rotenone bearing powder (ground root)

2 ounces of soap

1 gallon of water

Use 1 pint per animal.

Dips

Formula: 100 pounds 5% rotenone bearing powder

100 pounds of wettable sulfur

1000 gallons of water

It is desirable to hold the animals in the vat at least 2 minutes.

Interval Between Treatments

For most economical control, apply the materials at 30-day intervals during the grub season. For complete eradication it is recommended that the application be made at two-week intervals and at least 4 times.

Benzene hexachloride and other new insecticides are still in the experimental stages.

Extension workers point out that producers must be sold on the economic importance of controlling cattle grubs in their own herds.

This group recommends that further research work be instituted along the following lines:

1. Specific evaluation of losses due to cattle grub infestations.
2. Further search for more efficient materials for cattle grub control.
3. Further information on biology of the cattle grub.

Oklahoma City

Louse Control Committee Report

W. S. McGregor, Walter D. Armer, E. F. Knippling (member at large), Stirling Kyd

Chairman

A. Cattle Lice

1. DDT

- a. Dipping - One dipping with a 0.5% DDT Suspension (made from wettable or water dispersible DDT) has been found to give practical control.

- b. Large Power Spraying - When large power sprayers are used it is recommended that 0.5% DDT Suspension be applied at the rate of 6 to 8 quarts per adult animal. Under most conditions 2 treatments at about a 3-week interval will be necessary.
- c. Small Power Units or Hand Spraying - 1.5% DDT Suspension is recommended for use in small power outfits or knapsack-type sprayers. Approximately 2 quarts should be applied to each mature animal and 2 applications at about a 3-week interval is recommended.
- d. Dusting - A 10% DDT dust, applied at the rate of 6-8 oz. per adult animal may be used. A second treatment, applied about 3 weeks after the first, is required.

2. Rotenone

- a. Dips - The old standard rotenone dip formula of 10 lbs. of 5% cube or derris powder, 100 lbs. of a 325-mesh wettable sulfur to each 1000 gals. of water, is recommended. Two applications applied at 14 to 18 day intervals are necessary.
- b. Sprays - One pound of 5% cube or derris powder to each 100 gallons of water is recommended for power sprayers. Two applications applied at 14 to 18 day intervals are necessary.

3. Equipment

- a. When applying DDT or rotenone sprays, power equipment is recommended for large herds. For best results these outfits should maintain at least 250 lbs. nozzle pressure.
- b. On small herds good results can be obtained by using small power outfits, or knapsack-type sprayers. It cannot be over-emphasized that the coat of the entire animal must be thoroughly saturated. Particular attention should be paid to wetting the head, ears, brisket, escutcheon, and the tail head and brush.
- c. If liquid treatments cannot be used, dust may be applied with the garden-type rotary or bellows duster.

4. Other Materials

- a. Benzene hexachloride - Due to wide variations in the chemical composition of samples of Benzene hexachloride that have been tested, and due to a lack of sufficient toxicological information regarding the effects of this material on man and animals, its use is not recommended at this time. It is recognized, however, that certain samples of benzene hexachloride used at concentrations of 0.1 to 0.3 percent gamma isomer have been highly effective in controlling cattle lice.
- b. 1068 and 3956 - Sufficient information is not available upon which to base any recommendations for the use of 1068 and 3956.

B. Sheep and Goat Lice

- 1. It is recommended that Stock 1235 (see BE&PQ Cir. E-679) be used in water at a 0.2% DDT concentration. Dips are preferred and sprays are not recommended unless dipping facilities are not available. A thorough wetting of the animal is essential if the spraying method is used.

Sheep and goats may be dipped in any condition of fleece but it is recommended that the dipping be done out of the shearing pen. This will save handling the animals and will result in savings of dipping material.

The 1235 Stock Solution should be tested for compatibility with the water before charging vats. Very hard waters may not give a satisfactory emulsion.

This same treatment is recommended for the control of dog lice and fleas on dogs. DDT in any form is not recommended for use on cats.

C. Hog Lice

1. One dipping with a 0.75% DDT Suspension has been found to give complete control. If dipping facilities are not available, sprays with the same concentration are suggested but more than one treatment may be necessary.

D. General Statements

1. Early Treatments - For cattle lice it is recommended that control treatments be applied before louse populations reach a high level. The exact dates for applying treatments cannot be specified due to geographical differences and other factors, but it is suggested that the optimum time of treatment be determined in the different localities by close examination of the animals in the fall.
2. Coordination with fly control operations - Due consideration should be given to applying DDT in amounts and thoroughness of coverage to obtain adequate control of lice when cattle are treated for fly control. Such consideration may eliminate the need for a specific louse control treatment at a later date.

E. Recommendations for further research

1. Further and more careful studies on the feasibility of controlling lice by following a more careful hornfly control program.
2. Study of the effects of different types of water on the residual properties of DDT.
3. Studies of the compatibility of DDT and arsenical dips.
4. Extensive studies on the relative effectiveness of DDT, benzene hexachloride, 1068, 3956, and other new materials for the control of lice on livestock.
5. Further studies on equipment and new and improved methods of application.
6. Studies on the relative efficiency and safety of DDT emulsions and suspensions.
7. Additional information on the spread of lice, particularly on the importance of flies and the litter in barns and stables.
8. Specific information pertaining to the losses resulting from louse infestations on all types of livestock.

Oklahoma City

DDT and Other Materials for Fly Control Committee Report

A. L. Smith, W. G. Bruce, Geo. D. Jones, Chairman

In consideration of the control of ectoparasites of cattle, this committee feels that recommendations should not be limited to any one species of insect. For instance, it has been brought out by various Federal and State workers that effective hornfly control by the use of DDT will also keep some other ectoparasites under control.

It is also realized that different methods of application will be used and that concentration of DDT sprays and the amount of material used will vary with the method of application. On the average stock farm the materials will be applied by hand sprayers and small power sprayers. Large operators will use dipping vats and large power sprayers.

It is the recommendation of this committee that only water-dispersible (wettable) powders be used for the control of hornflies on cattle. DDT water-dispersible powder has been found to be economical and effective under a wide variety of

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conditions, and has been proved to be safe from a toxicological standpoint for use on livestock. No other DDT preparations available at this time are known to combine all these properties.

The concentration of DDT and the quantity to use depends upon the method of application and local conditions. It has been found that sprays should contain a minimum of 0.2% DDT for satisfactory hornfly control. For longer protection from hornfly attack, the higher concentrations, up to 1.5% of DDT, are desirable.

The quantity of spray to be applied will vary with the size and breed of animal and method of application. The quantity will vary from one pint to one quart or more when cattle are sprayed. Larger quantities will be used when cattle are dipped.

DDT sprays when applied only to the livestock are considered ineffective in the control of the stable fly but this pest can be controlled by spraying barns, sheds, and other resting places of the flies.

For the control of stable flies and house flies on the farm or ranch, sprays containing 2.5% DDT (made by mixing 2 pounds of wettable powder containing 50% of DDT to 5 gallons of water) should be applied to the interiors of barns, sheds, and other resting places of the flies. These sprays are best applied by small power sprayers or knapsack sprayers, completely wetting the interior surfaces without appreciable run-off. The pressure of power sprayers should be reduced to about 100 pounds per square inch to avoid rebound of the spray and consequent waste.

DDT has not been found effective in the control of the horse fly.

Proposed Research and Educational Activities

1. Toxicity of DDT and other new insecticides to livestock.
2. Control of horse flies and deer flies.
3. Control of buffalo gnats.
4. More work on the concentrations of DDT sprays for the control of hornflies.
5. Effect of DDT on screwworm flies.
6. Control of stable flies.
7. Effect of DDT on mosquitoes attacking cattle.
8. Intensive education and demonstration of control measures.

Oklahoma City

Other Livestock Pests Committee Report

F. Gray Butcher, I. H. Roberts, C. S. Rude, Chairman

Your committee suggests a marked intensification of educational procedures on the screwworm fly problem. These should include:

1. Further education in screwworm areas, with insistence on more complete compliance with the ranch management program outlined in BE&PQ Cir. E-520.
2. Education of local shippers as to the seriousness of permitting transportation of infested or susceptible animals. This should include recognition of damage to the reputation of the shipping area.
3. Marked increase of education in the more northern States where infestations recur as to dangers from screwworms, with emphasis on inspection when newly arrived stock are unloaded, recognition and immediate attention to treatment of all cases of infested animals.

We recognize the need of critical consideration of adequate regulations pertaining to the shipping of animals from screwworm infested areas. These should include adequate provisions for inspection and treatment at loading points, feeding and rest stations en route and at destination. Car and truck disinfection with DDT residual spray is also indicated.

Accordingly, we recommend that all persons present at this conference attempt to initiate interest and action from their local livestock industry on this matter. Immediate consideration to proper regulatory measures by the USDA and State regulatory agencies is also recommended.

Due to the scarcity of turkey red oil, adequate supplies of Smear 62 cannot be expected. Also due to this shortage, many materials labeled as Smear 62 are improperly formulated, with a marked decrease in their effectiveness. Accordingly, a satisfactory new material known as Smear 882 has been developed and should be introduced to stockmen. This new smear has been developed by the same agency that developed Smear 62, and it has proved to be equal in performance. The formula of the new smear is:

Diphenylamine - - 32 parts)
Benzol - - - - 35 parts)
Lamp Black - - - 21 parts) by weight
Triton X 300 - - - 2 parts)
N-Butyl alcohol - 10 parts)

This formula is similar to Smear 62 which contains Diphenylamine 3-1/2 parts, benzol 3-1/2 parts, lamp black 2 parts, and turkey red oil 1 part (all proportions by weight). Details of the new formula will be available about December 15 in E Circular No. 708 of BE&PQ under the tentative title "Smear 882 for the Treatment of Screwworms in Livestock."

The committee calls attention to the efficiency of the new fleece worm remedy, formula MST93F (Menard Station No. 793 Fleece worm remedy) as outlined in Cir. E-633 of the BE&PQ. The formula consists of: diphenyl, 10 parts; benzol, 84 parts; triton 770, 1 part; N-butyl alcohol, 5 parts (all proportions by weight). It is recommended that an educational program be instituted relative to its use throughout the sheep raising areas.

Ticks

Your committee recognizes the importance of the Brown Winter Tick in certain areas and recommends its control by use of DDT. Results from Bureau of Entomology and Plant Quarantine studies reported in Journal of Econ. Ent., Volume 31, May 1946, with use of Stock No. 1235. This consists of 1 part (by weight) of DDT in 5 parts of soluble pine oil. When diluted to contain 0.8% DDT this treatment gave very effective control when applied as a wash or spray. Thorough wetting of all portions of the animal is essential. DDT wettable powder at similar strength has likewise been reported effective.

For the Lone Star Tick, discussion revealed no effective methods of control against this pest.

Gulf Coast Tick

W. G. Bruce reported that in Florida 2.3% DDT spray gave excellent control, apparently equal to smears. Good control was also reported with both DDT smears and washes by C. S. Rude in Texas. Reference is made to BE&PQ Cir. E-686, reporting the use of Stock No. 1037 as a control measure. This material is composed of DDT, 5%; rosin, 47%; Hercolyn (hydrogenated methyl abietate) 33%; and dibutyl phthalate, 15% (all percentages by weight). Same strength DDT spray was also

effective against Cattle Fever Tick in a limited number of tests. In a single test pasture treatment with DDT airplane spray provided approximately 90% kill.

Spinose Ear Tick

DDT is not effective against this form. Pyridine in a non-drying adhesive smear has proven very effective. A formula known as Stock 1029 is recommended. It consists of pyridine, 10%; rosin 45%; hercolyn, 40% and dibutyl phthalate, 15%. Two treatments per year, at spring and fall round-ups are recommended, but the animal treatment must be supplemented with spraying of the various areas where the ticks are concentrated, especially under salt troughs. For this use a mixture of equal parts kerosene and crank case oil is recommended. Details are given in BE&PQ Cir. E-695.

Brown Dog Tick

This tick is becoming a more general pest on dogs, and as a nuisance around houses. Good control can be obtained with DDT treatment of infested premises and on animals. Building treatment requires thorough coverage of walls, baseboards and casing with 5% DDT in an odorless kerosene and a 10% DDT powder blown into cracks. On dogs, a 10% DDT powder or 1% DDT pine oil emulsion wash is recommended. One to three treatments indicated. Further details reported in BE&PQ Cir. E-292.

Sheep Tick or Ked

Research has revealed two materials effective against this pest. (1) Rotenone dip, at rate of 0.5 lb. of 5% rotenone-bearing powder (ground root) per 100 gallons water. (2) 0.2% DDT dip prepared from Stock No. 1235 (see BE&PQ Cir. E-679).

A single treatment with either material results in complete kills and suggests the possibility of complete eradication.

Where dipping is not considered practical, spraying and dusting may be used. A 0.25% DDT spray applied with a power sprayer has produced somewhat erratic results but promises acceptable farmer control in certain areas on medium open fleece breeds.

Dust application of 0.5% rotenone with a power duster has given similar results.

Sheep Head Bot (Grub-in-Head)

Control obtained by injection of a 3% aqueous lysol solution into the nasal passages under pressure. Procedure and equipment described in Journal of the American Veterinary Medical Association (97 (765) Dec. 1940), and in mimeograph issued by U. S. Bureau of Animal Industry under title, "The Sheep Head Grub and Methods of Control."

Poultry Ticks and Mites

Tests have shown that fowl ticks and poultry mites may be effectively controlled by complete spraying of poultry houses and roosting places with a solution of 5% DDT in kerosene. Similar strength of DDT in emulsions and suspensions are effective against fowl ticks.

We recommend further investigations on methods and materials for control of ticks, poultry parasites, and sheep head bots. This is especially necessary for the Lone Star Tick. Studies for improved screwworm smears should be continued and research on hog mange control procedures is desirable.

Cheyenne

Cattle Grub Committee Report

T. R. Robb, Joseph Muir, G. S. Weaver, Ephriam Hixson, Chairman

A. Summary

1. Rotenone is the only known insecticide that will give satisfactory control of cattle grubs.
2. Time of treatment: Begin 30 days after the first grubs appear in the back, repeat at 30-day intervals as needed.
3. Number of applications: Minimum of two applications in the common grub area and 4 to 5 for the northern grub area where the two species overlap. Vary number of treatments according to local needs.
4. Concentration for various methods.

Wash - 12 ounces of 5% rotenone powder in 1 gallon of water with suitable wetting agent. Wetting agents--neutral soap, 2 ounces, or wettable sulfur, 6 ounces.

Dust - Rotenone plus diluent to make 1 to 1.67 percent rotenone in the finished dust. (Diluents: Tripoli earth, Pyrophyllite, 325-mesh.)

Sprays - 7-1/2 pounds 5% rotenone powder (without wetting agent) in 100 gallons of water, or 5 pounds 5% rotenone powder, 10 pounds of wettable sulfur per 100 gallons of water, depending upon hardness of water. Rotenone extracts at suitable concentrations may be used.

Dip - Dipping in general for grubs considered too expensive, but where used: 7-1/2 to 10 pounds 5% rotenone powder, 10 pounds wettable sulfur, 100 gallons of water - hold animals in vat 2 minutes. Two ounces of muriatic acid per 1000 gallons of water suggested as substitute for sulfur.

5. Dosage per animal - Use enough to cover infested area and to penetrate into grub holes. Dust, 3 ounces per animal; spray, 1 gallon per animal.
6. Pressure for spraying - 400 pounds per square inch. Use a solid cone pattern, drive-spray nozzle.
7. Equipment for holding and handling - Chutes or narrow pens preferable.
8. Extension Program

Losses - occur from cost of trimming grubby carcasses, loss of meat and hides. Losses also occur during the heel fly egg laying season because of the annoyance to the animals. Heavy losses probably occur from grubs migrating through tissues of animal although no data are available to support the statement.

Educational programs should be extended to take information on losses and also best methods of control to growers. Four-H and vocational agriculture students are probably the best medium for projecting the program to the farm. The extension service job is to promote, educate and help organize programs, but except for demonstration purposes it should not actually participate in control activities.

Cheyenne

Louse Control Committee Report

R. W. Every, F. W. Wilson, C. E. Smith, H. C. Manis, Chairman

Recommendations: Cattle Lice

Methods - Spraying

Dipping

Washing

Concentrations

Spraying - DDT - 0.25-0.5% (4-8 lbs. of 50% wettable DDT)

Minimum - 0.25%. One application.

Dipping - DDT - 0.25-0.5% (4-8 lbs. of 50% wettable DDT)

Minimum - 0.25%. One application.

Rotenone - 1 lb. 5% ground cube or derris root (fine)

10 lb. 325-mesh wettable sulfur

100 gals of water - followed in 16-18 days by second application.

Dusting - DDT - 3-10% dust can be used if desired.

Washing - For individuals or small groups of animals DDT - 0.25-0.5% (4-8 lbs. 50% wettable DDT) 1 application.

Further Research needed on -

1. DDT in combination with other insecticides.

2. Dusting with insecticides.

3. Newer insecticides (Benzene hexachloride, Velsicol, 1068, etc.).

4. Economic losses occurring from infestations.

Sheep and Goat Lice:

Dipping - 1235 Stock Emulsion - 10 pints to 100 gallons of water (.2% DDT)

0.5% DDT suspension (8 lbs. 50% wettable DDT to 100 gallons)

1 application.

Further research needed on spraying.

Hog Lice:

Dipping - For hog lice a single dipping has been found to give complete control when the concentration of DDT is as high as .75% using 50% wettable powder.

Spraying - Satisfactory control of hog lice can be obtained with one treatment of DDT sprays (using 50% wettable powder) at concentrations of .25% to .5% DDT. For complete control a second treatment may be required. Sprays should be applied so as to thoroughly wet the animal.

The Stock emulsion 1235 diluted to .4% DDT is also recommended.

Dusts - It was reported that a 10% DDT dust applied at the rate of 1 pound per 200 square feet of floor space gave satisfactory control of hog lice where hogs had access to good hog houses and could be thoroughly exposed to the treated litter and floors.

Chicken Lice -

(1) Sodium fluoride - 1 oz. to 1 gal. of water - by dipping.

("Pinch" method for use during cold weather)

(2) 5%-10% DDT dust.

Further research needed on DDT, Benzene hexachloride, etc.

Cheyenne

DDT and Other Insecticides for Fly Control Committee Report

Harold Gunderson, J. J. O'Connell, George List, E. G. Kelly, Chairman

1. Horn Flies and Mosquitoes:

Use 0.2% DDT in high pressure sprayers (400-500 lbs. pressure), or 0.5% DDT in low pressure or hand-operated sprayers (ordinarily from 1 to 2 quarts of spray as required per animal). Use 50% DDT wettable spray powder made by reliable company. Number of applications can be determined by observations of grower and/or sprayer operator. Spray when fly count on 3 consecutive days averages 25 horn flies per animal. Make counts at same time each day.

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2. Stable flies and house flies:

Spray inside walls, ceilings, windows, supports, piping and wires of farm outbuildings with 2-1/2% DDT, using 5% DDT wettable powder. Where breeding places cannot be eliminated or treated adequately, soak 3 ft. cords in 5% DDT and hang in and near heavily infested buildings. In addition, for stable fly, eliminate all breeding places around the barnyard, if possible; spray outside walls, fences, straw and weed piles and other breeding and resting places with 0.2% DDT or 0.5% DDT every time the animals are sprayed.

3. Pressure:

The amount of pressure to be used in spraying buildings must be determined by each State, however, we feel that 60 to 100 lbs. pressure is most desirable.

4. Quantity of spray per 1000 square feet:

General experience indicates that 1 to 2 gallons of 2-1/2% to 5% DDT per 1000 sq. ft. of surface is most effective and most economical. With higher pressures and higher gallonage, reduce the DDT concentration. We subscribe to the U. S. Bureau of Entomology and Plant Quarantine recommendation of 200- or -- mg. per sq. ft. as a standard to work from. Individual experience will indicate the wisdom of increasing or decreasing this dosage.

5. Equipment:

The most satisfactory equipment for general use appears to be as follows:

Cattle: 3 nozzle broom, 4 to 6 ft. handle, trigger cut-off.
Nozzle aperture 4/64 to 5/64 with whirl plates.

Barns: For 0.2% DDT, same as above. For 2-1/2% DDT use 1 No. 4 or
No. 5 disc nozzle or 80-0.2 flat or fan nozzle. The amount
of pressure will determine the type of nozzle to use; 50-80
pounds pressure -- flat or fan nozzle, 150-400 lbs. pressure,
cone-type nozzle.

Cheyenne

Other Livestock Pests Committee Report

H. B. Mills, Claire Titensor, Clifford Iverson, Martin Muma, C. S. Rude, Chairman

This committee endorses the report of the Oklahoma City conference on education and regulation as they relate to screwworm control. It feels that an educational program in outlaying areas, where infestations are not necessarily common, is important.

This committee further endorses the above committee's statement relative to the substitution of Smear 882 for Smear 62.

It further endorses the statement of the Oklahoma City group concerning wool maggot educational and control work.

The winter tick recommendations of the Oklahoma City committee are in accord with the ideas expressed at the Cheyenne meeting.

There is some evidence that the spinose ear tick may be establishing itself in areas to the north of those presently accepted as within its permanent range of distribution. The committee would further suggest increased attention on the part of extension and research workers to this pest as it may occur in northern areas. We agree with statements of the Oklahoma City group relative to control.

RECOMMENDATION OF THE OKLAHOMA CITY GROUP CONCERNING WOOL MAGGOT EDUCATIONAL AND CONTROL WORK

Recommended controls for the sheep tick include: (1) 4 pounds of 50% DDT wettable powder in 100 gallons water; (2) 0.2% DDT water solution prepared from emulsion Stock 1235, as described in BE&PQ Cir. E-679; (3) 6 ounces of ground root containing 5% rotenone in 100 gallons water.

These materials give complete control when carefully applied either as a dip or spray. A spray applied only to the back of an animal gives practical control but not eradication.

DDT sprays, outlined above should be applied at the approximate rate of 2 quarts per animal. Time of treatment should be governed by local conditions and practices, and mixing of treated and untreated animals should be avoided.

Thorough spraying of chicken houses with 0.2% DDT will completely eradicate bed-bugs, and give several months residual action. Chicken mite control was not discussed at this conference.

Cheyenne

Report of the Committee on Recommendations for Further Research

E. G. Kelly, H. C. Manis, Ephriam Hixson, C. S. Rude, E. F. Knippling, Chairman

The committee on recommendations for further research recognizes the great advances that have been made on the biology and control of insects and other external parasites of animals. The committee is aware of the fact, however, that more effective and more desirable methods of control are needed for many of the pests of livestock. Also, certain biological data are urgently needed to serve as a guide in developing the most effective methods of control.

Discussions of the many problems under a wide variety of conditions as brought out during the last two days have suggested the need for outlining specific research activities. Although many of these are applicable to other parts of the country they are for the most part of primary concern in the western part of the United States.

The recommendations set forth are intended primarily for those groups and individuals charged with the responsibility of conducting research. Extension service personnel can, however, contribute valuable data on the practical aspects of pest control and it is urged that they take advantage of every opportunity to obtain precise information on the effectiveness of various methods of control.

A. Cattle Grubs

1. Research should be directed towards the development of methods that will permit control of cattle grubs with a single treatment before the larvae reach the back of the animal.
2. Further studies on immunity and resistance of the hosts to the parasite should be initiated.
3. Further studies on the relative efficiency of rotenone dusts, sprays or washes are needed employing various dosages of active ingredient.
4. Studies on the relative efficiency of various types of spray equipment are needed including the effects of various degrees of pressure and amounts of liquid employed.
5. Obtain further data on the residual action of various rotenone treatments applied under different environmental conditions.

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6. Tests with new insecticides should continue, including such materials as benzene hexachloride, 1068, 3956, and others that might prove effective.
7. Information on the distribution and seasonal activity of *H lineatum* and *H bovis* are needed. This information should serve as a guide in determining schedule of treatments.

B. Louse Control

1. Further studies on the optimum concentration and relative efficiency of DDT dusts, suspensions and emulsions are needed for control of lice on livestock.
2. The relative effectiveness and practicability of DDT, benzene hexachloride, 1068, and 3956 and other louse treatments should be determined for all species of lice affecting livestock.
3. The relative efficiency and practicability of dips and sprays for controlling lice on livestock.

C. Flies affecting livestock

1. Horn flies
 - a. Further studies in various localities are needed to determine the optimum concentration and amounts of DDT spray to apply for horn fly control.
 - b. Further observations on the biology of horn flies are required. Of particular importance is a thorough knowledge of normal season abundance and life history. Such information may prove useful in determining the most effective spray program.
 - c. Determine the relative effectiveness of DDT, 1068 and 3956 for controlling horn flies.
2. Stable flies
 - a. An effective material for application to the animals is urgently needed.
 - b. Further studies on the treatment of buildings and other resting places as a control for stable flies are recommended.
3. Horse flies and deer flies
 - a. Intensive studies on the biology and control of deer flies and horse flies are recommended.
4. Black flies
 - a. Investigations on the control of black flies affecting livestock are suggested.

D. Ticks

1. Determine the effectiveness of DDT, 1068, benzene hexachloride, 3956 and other new insecticides for the control of various species of ticks affecting livestock.

E. Poultry Parasites

1. Investigations on the control of lice, mites and ticks affecting poultry are desirable.

F. Screwworms

1. Development of more effective and more desirable screwworm treatment.
2. Continue surveys and other studies that will provide information useful in preventing the spread of screwworms.
3. Obtain more information on the biology, distribution, importance and control of sarcophagid parasites affecting fur bearing animals.

G. Hog Mange

1. Further research on the control of hog mange is recommended.

H. Sheep Bots

1. Further research on the control of sheep bots is recommended.

General Recommendations:

1. Obtain precise information on the losses caused by various insects and arachnids affecting livestock.
2. Further tests and observations are needed to determine the feasibility of controlling lice and other parasites in conjunction with the fly control program.
3. Further studies are suggested in efforts to improved equipment and methods of application for the control of pests of livestock.
4. Studies on the factors influencing the lasting properties and effectiveness of DDT and other insecticides are needed. Consideration should be given to evaluating the various factors such as rainfall, sunlight, humidity, type of surface, degree of pressure employed in applying sprays, etc.
5. Further tests against various pests are needed with combinations of various insecticides, such as DDT, rotenone, sulfur and other newer materials.
6. Studies on the mode of action of DDT and other insecticides in killing horn flies, stable flies, house flies, and horse flies.
7. Further information on the toxicological effects on man and animals is urgently needed for DDT, benzene hexachloride, 1068 and 3956.

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Outlook for Supplies of Rotenone Insecticides

Review of the world's supply of rotenone bearing root shows that the quantity that should be available for use in the United States for the insecticidal year beginning October 1, 1946, will be substantially the same as the amount that was available in 1942. With this quantity there is reason to believe that the amounts that can be made available for use in cattle grub control during the 1946-47 season will be substantially greater than those used in any preceding year.

However, estimates of the quantities that States desire to use for this purpose disclose that they contemplate using amounts many times greater than those used last year. It is suggested, therefore, that those responsible for cattle grub control implement their orders as promptly as possible and then plan their programs around the amounts which the industry indicates they can supply by the time needed.

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Note - In compiling this document the desire was to incorporate the committee reports as they were turned in at the conferences. After examining them, however, it was decided to make a few changes in the interest of greater uniformity in style of presentation and clarity.

Since time did not permit checking the revisions with the authors it is hoped that they will be accepted by them as intended. C. D. L.